FACTSHEET

Plant Protection & Quarantine

United States Department of Agriculture

Animal and Plant Health Inspection Service

March 1996

Karnal Bunt: A Fungal Disease of Wheat

Karnal bunt, or partial bunt, is a fungal disease of wheat, durum wheat, and triticale (a hybrid of wheat and rye). Typically, only a portion of the kernel is affected; this is why the disease is sometimes called partial bunt. The damage is twofold: infected plants produce less grain, and the quality of the grain itself is lessened. Flour made from bunted kernels is discolored and has an unpleasant, though harmless, odor and taste.

Generally, wheat containing more than 3 percent bunted kernels is considered unfit for human consumption. Wheat containing lower percentages of bunted kernels may be salvaged and combined with healthy grain. Wheat containing any amount of bunted kernels, however, is somewhat reduced in quality.

History

The disease was first reported in 1931 in wheat-growing areas near the city of Karnal in the Indian State of Haryana. Since then, it has been found in all major wheat-growing States of India, as well as in Pakistan, Iraq, and Afghanistan. The disease may have been present in Mexico since 1970 and has been well established in some areas in northwestern Mexico since 1982. Federal regulations prohibit entry into the United States of seeds, plants, unprocessed straw, chaff, and products of the milling process (other than flour) of wheat from countries where Karnal bunt is known to occur. These commodities can enter only with a U.S. Department of Agriculture (USDA) permit for scientific purposes.

Countries with Karnal bunt, on the whole, do not suffer enough loss consistently to initiate eradication procedures. Mexico is one exception: scientists there are studying Karnal bunt and developing control programs. But for the others, it is more economical to let some crops be destroyed than to spend hundreds of thousands of dollars to eliminate the disease, especially since these countries export very little wheat.

Impact

Although the overall crop losses caused by Karnal bunt might not be severe, the disease has quarantine significance and thus could affect U.S. grain exports. The United States is the world's leading wheat exporter, accounting for one-third of world wheat exports with U.S. exports in fiscal year 1995 valued at $4.9 billion.

Detection

One reason Karnal bunt is difficult to control is that it is difficult to identify. Infected grain shows none of the symptoms until it has reached maturity. Even then, the disease cannot be detected in plants growing in the field: the grain must be removed from the head and examined. In addition, three other diseases can be mistaken for Karnal bunt: black point, common bunt, and dwarf bunt of wheat. These diseases are already established in the United States.

When checking their crops for Karnal bunt, wheat growers should look for bunted kernels that are fragile, dark in color, and fishy smelling. The kernel usually remains whole, although part of the germ may be eroded. Cracks in the surface reveal a black powdery spore mass within the endosperm at the embryo end of the kernel or along the kernel groove.

Any kernels that show signs of contamination should be placed in a plastic bag within a sturdy container and taken to the nearest State regulatory official or to a field office of the Animal and Plant Health Inspection Service's (APHIS) Plant Protection and Quarantine (PPQ) division.

How It Spreads

Karnal bunt is caused by the smut fungus *Tilletia indica* Mitra (also known as *Neovossia indica)* and is spread by spores. Infection occurs during the flowering stage of the host plant, when its developing ovary comes into contact with infectious sporidia. The ideal conditions for infection are cool weather and rainfall or high humidity. In soil, the spores may be able to survive as long as 5 years.

The spores can be carried on a variety of surfaces—plants and plant parts, seeds, soil,

elevators, buildings, farm equipment, tools, and even vehicles. Spores and the sporidia they produce also can be windborne, although the sporidia are fragile and may be able to move only short distances.

Recent Developments

On March 8, 1996, scientists with USDA's Agricultural Research Service (ARS) confirmed the presence of Karnal bunt in Arizona in certified durum wheat seed of the variety known as Reva. Suspect seed samples were detected at a seed dealership during routine testing by the Arizona Department of Agriculture. After forwarding samples to the State's agricultural lab, ARS was given samples for testing.

A scientific panel comprised of State, Federal, and industry technical experts and scientists is being convened to determine further actions.

This find is localized, and emergency quarantines have been instituted on the properties, seed, farm equipment, planted wheat, and soil associated with the infected wheat. State and Federal quarantines will be put into place to augment this emergency action, and USDA has established a wheat export certification team to develop options for dealing with potential trade issues.

Eradication

The following procedures are planned to eradicate an outbreak in the United States: First, the area would be quarantined immediately to ensure that no wheat, seeds, or soil move from the area. Next, an emergency team would conduct delimiting surveys of the area to determine the exact location of the disease.

All crops in infested fields would be destroyed to eliminate Karnal bunt. The property may be treated to kill any remaining spores. Following treatment, grain infected with Karnal bunt would be used only for nonpropagative purposes or would be destroyed. No host crop—wheat, durum, or triticale—would be planted in any contaminated field for a period of 5 years from the time of infection.

Nonhost crops such as alfalfa or cotton should be grown in the interim. Planting wheat varieties that are resistant to the disease would be the ultimate control method. Researchers continue to seek improved wheat varieties that are resistant to Karnal bunt.

Survey Work

APHIS' PPQ officials, in cooperation with State counterparts, have conducted survey operations of harvested wheat in a number of States over the past few years to determine if Karnal bunt was present. These survey efforts will be continued and intensified.